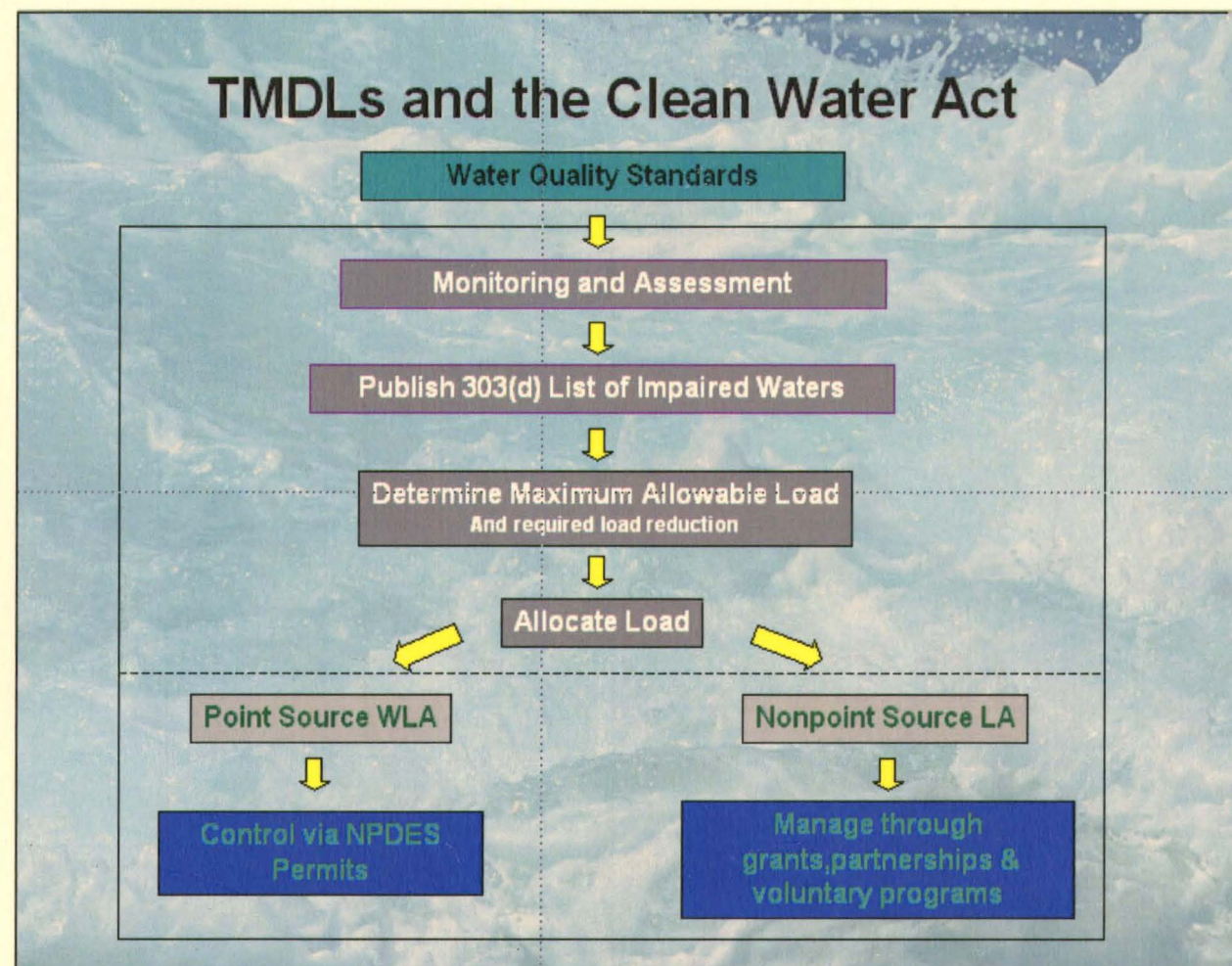


TMDL Development: Process Improvement



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Objective:

The goal of the project is to evaluate the total maximum daily load (TMDL) development process, changes that have been made in last 2 years, and any opportunities to improve the process for desired benefits i.e., an implementable and defensible TMDL. To improve processes that would result in TMDL development at a pace that meets federal CWA requirements. Also, improve the contents, clarity, and format of the TMDLs that would result in them being implemented to achieve water quality improvements.

Background:

DHEC maintains an extensive ambient water quality-monitoring network to assist in evaluating the quality of waters in South Carolina. Over a five-year period, the Department monitors over 2,000 locations statewide and performs approximately 300,000 water quality tests. Monitoring results are compared to water quality standards (WQS) to determine if waterbodies are meeting the standards or if they are impaired (not meeting the WQS). When a waterbody is impaired, it goes on the 303(d) list of impaired waters. Section 303(d) of the federal Clean Water Act (CWA) and EPA's Water Quality Planning and Management Regulations (40 CFR Part 130) mandates that every two years each state must compile a list of waters that do not meet WQS. Once a waterbody is on the 303(d) list, it is targeted for water quality improvement and a Total Maximum Daily Load (TMDL) must be developed by the State and approved by the Environmental Protection Agency (EPA) in accordance with Section 303(d) of the CWA. A TMDL is a calculation of the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards. A TMDL is a plan or road map that would

direct targeted resources and activities to ultimately improve the water quality. Hence, a TMDL is both a planning process for attaining water quality standards and a quantitative assessment of pollutant sources, pollutant loadings, and pollutant reductions needed to restore and protect surface water bodies (rivers, streams, lakes, and estuaries). The objective of a TMDL is to determine the loading capacity of the water body and to allocate that load among different pollutant sources so that appropriate control actions can be taken and water quality standards achieved. DHEC currently has 408 approved TMDLs.

Once a TMDL has been developed, the next step is implementation. At this point, the TMDL can be used to formulate a strategy to reduce the pollutant loading. Permits for point sources must be consistent with the TMDL. All of the appropriate permits are modified to meet the wasteload allocations (WLA), requirements, and assumptions of the TMDLs once approved by EPA. Generally, DHEC does not have regulatory authority over the control of nonpoint sources. In such instances DHEC utilizes Section 319 funds for the implementation of nonpoint source TMDLs. Section 319 of the CWA provides annual funding to all states to manage the nonpoint source program that involves soliciting, developing, and implementing nonpoint source TMDL projects. To date, the Department has a total of 26 projects implementing 102 TMDLs, mostly for fecal coliform bacteria. This represents a total investment of approximately \$13.6 million and covers more than three million acres.

As stated above Section 303(d) of the CWA requires states to identify waters that are impaired by pollution and requires states to establish TMDLs of pollutants to ensure that water quality standards can be attained. Implementation of the Section 303(d) remained dormant from 1972 to early 1990's when environmental groups filed lawsuits in more than 35 states. The goal of these law suits was twofold; first to make EPA and states implement the goals and objectives of the CWA and second, to see that EPA and states address non-point sources and other sources that are responsible for impairments and have not been controlled up to this point. Hence, the TMDL program has become controversial when faced with new requirements. Further, the costs to implement those requirements are mandated without any additional resources. States are expected to implement this provision of the law, and industries, municipalities, farmers, and other expected to deploy new pollution controls to meet TMDL requirements. In addition, EPA has not been able to provide any clear guidance or policy that is consistent and provides expectation of the goals of the TMDL program success.

Components of a TMDL Document:

A TMDL is mathematically presented as a sum of all point sources that receive a wasteload allocation (WLA), nonpoint sources that receive a load allocation (LA), and margin of safety (MOS) to account for uncertainty in predicting how well pollutant reductions will result in meeting water quality standards.

$$\text{TMDL} = \sum \text{WLA} + \sum \text{LA} + \text{MOS}$$

Typical components of a TMDL document that are required for submission to EPA are:

1. Identification of waterbody, pollutant of concern, applicable water quality standards, and numeric water quality target
2. Watershed, land use, and source characterization
3. Estimation of the current pollutant loading from all sources to the waterbody
4. Determination of needed reductions to meet the assimilative capacity
5. Allocation of allowable pollutant load among the different pollutant sources
6. Implementation strategy
7. Public participation

TMDL Development Process in South Carolina:

Section 303(d) of the Clean Water Act mandates TMDL development. In 2006, SC General Assembly allocated a budget item to develop TMDLs and improve water quality. Prior to 2006, DHEC had 1.5 full time positions (FTE) dedicated to TMDL development. After 2006, DHEC hired 5 additional staff fully dedicated to develop TMDLs. Currently, DHEC has 4 FTE dedicated to TMDL development. In accordance with EPA 1997 interpretive guidance policy, states were directed to develop TMDL for all listed impairments on the 303(d) list within 2 to 13 years starting from 2002. Currently, South Carolina has more than 970 sites listed on the 303(d) list. Therefore, approximately 75 TMDLs are required to be developed annually to meet the EPA's policy.

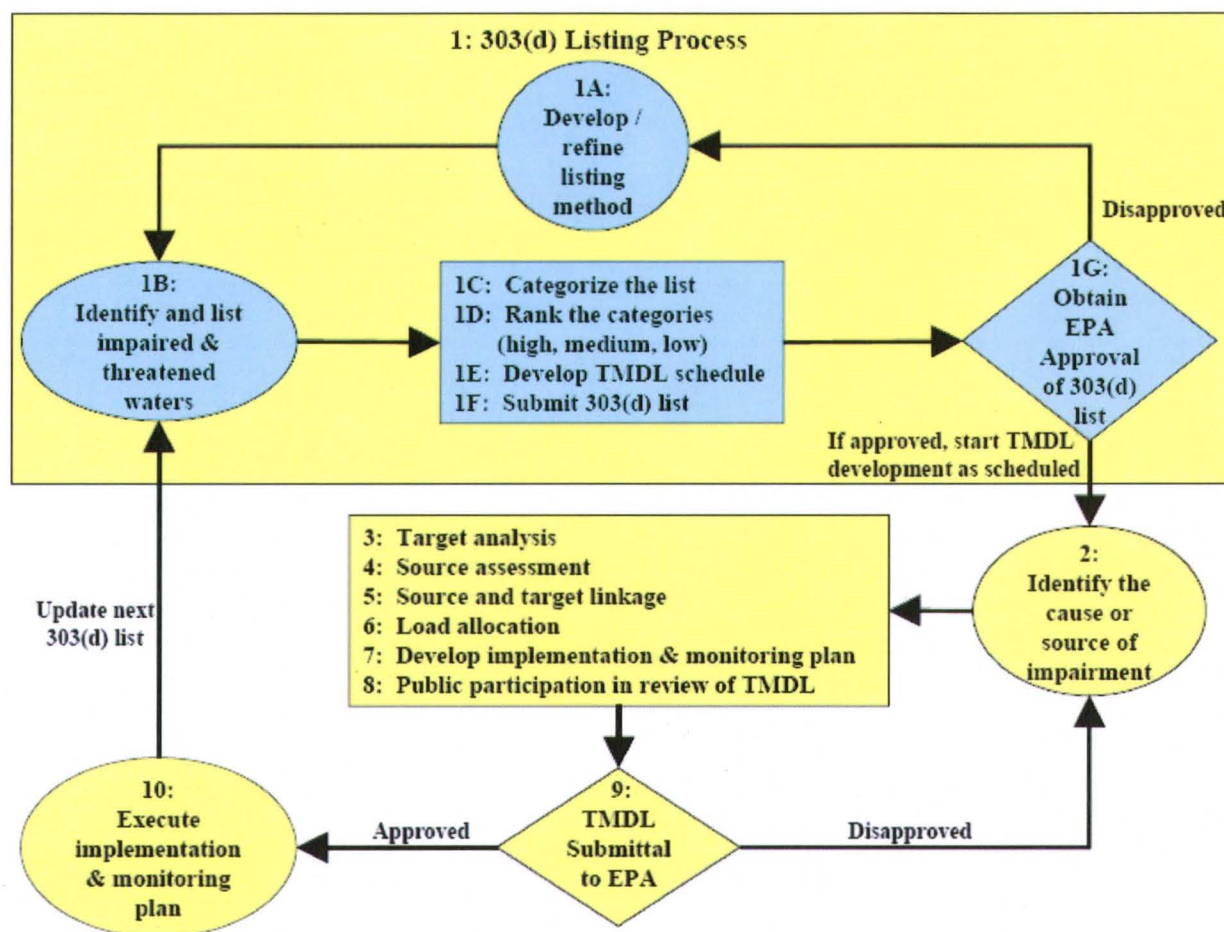
TMDL development process begins with prioritizing impaired waterbodies listed on 303(d) list based on various factors such as: severity of the pollutant, time the site was

listed, technical knowledge, available resources, etc. Once a TMDL development is initiated, the amount of data available, technical expertise (staff expertise), technical training, applicable water quality criteria, adequate model programs, other resource availability, public input, and legal appeals dictate the time period necessary for its completion. Hence, the TMDL development process is contingent on such factors that are at times unpredictable. The goal is then to evaluate all such factors and to identify ones that if modified or optimized, will have a potential to increase the efficiency for developing implementable and defensible TMDLs.

Especially in South Carolina, TMDL development has been recently impeded due to ambiguity in the federal regulations. The current federal regulations are vague in that they do not provide a direct correlation of pollutant sources and their applicability with load reduction and allocation in a TMDL. For example, the stormwater runoff within a watershed area is characterized as regulated and non-regulated based on whether an area is within a NPDES permit coverage area or not. The TMDL program with limited resources and no adequate regulations has difficulties allocating load reduction caused by various stormwater runoff sources. As a result, there exists confusion the part of both the regulated entities and the regulators alike with respect to responsibilities and compliance regarding stormwater runoff. During the last two years, the primary focus of the TMDL and stormwater permitting program has been to clarify and collaborate with EPA on variety of issues to obtain concurrence and acceptance with solutions to address some of these issues. EPA has established policy memorandums to clarify some of the expectations of the regulation but have not been able to promulgate any

comprehensive regulations. In 2000, EPA initiated such a process but due to congressional interest and other industry interest, EPA withdrew the proposed regulations that were designed to give clarity and specificity for developing and implementing Section 303(d) of the CWA.

Steps in a Typical State TMDL Process



Evaluating Major Factors:

1. Resource management (Including staffing, training and tools)

The goal is to have adequate staff that is appropriately qualified. Additionally the ability to retain experienced staff is crucial to have a robust TMDL development

program. In government, the challenge is working within a budget that is not predictable annually. Hence, identifying and managing uncertainties may be the best way to address this factor.

- The first challenge is to hire appropriately qualified staff. This might be at times challenging due to the budget constraints. However, an approach to recruiting individuals that have adequate qualifications, motivation, enthusiasm, and initiative to take ownership is prudent. These qualities allows for cultivating and developing staff to take on the development of complex TMDLs.
- The second challenge is the ability to retain the staff that has been hired and trained. For the TMDL program to be successful and productive it is prudent to have the ability to retain the staff that is trained to apply modeling expertise.
- The third challenge is the ability to plan and anticipate the needs for the program, especially acquiring technical programs, training for model applications and programs, and acquiring appropriate hardware and software. This would be beneficial in continuing to maintain and optimize the efficiency of the TMDL development program.

2. Appropriate Water Quality Criteria and Standards

In order for the TMDL program to be able to develop implementable and defensible TMDLs: appropriate, flexible, and numeric water quality criteria are very crucial. If the goal of the program is to develop a plan that has a reasonable assurance to be implemented and achieve the water quality improvements, the target (WQS) has to be specific and achievable. Currently, there are numerous water quality standards

(or criteria) that are not numeric and/or have been drafted with little flexibility, making compliance difficult. Ideally, during the development of the water quality standards, factors such as technical feasibility, practical application for implementation, sustainable resource expectations, etc. should be evaluated and strongly considered. By conducting such analysis during the standards development a reasonable assurance is given that the water quality standard can be achieved if implemented. When such analysis is not conducted, many times implementation is not achieved due to resource or technology limitations. This proves to be counter productive to the goal of the program – improve water quality for sustainable use.

3. Data Needs

One of the major factors that affect the development of an implementable and defensible TMDL is the availability of adequate data. As the TMDLs will then have to be implemented through various permits and possibly more stringent limits placed on the discharges to the surface waters, it is prudent that the data used to make such decisions is adequate. The quality of data, quantity of the data to reflect all hydrologic conditions, pollutant source data, flow data, and other site specific data are all important allocating load reductions necessary. In reality, due to limited resources, the scenario in which a perfect data set is available is very rare. TMDL developers and practitioners then have to evaluate the minimum data needed for development of a defensible and implementable TMDL. This evaluation varies with the type of pollutant and its relationship with the environment. For example, developing TMDLs for dissolved oxygen versus nutrients has different data needs

due to their relationship and effects on water quality. It is rare that we have a scenario where all of the data needed is available. Hence, planning, forecasting, and using only limited resources to get the most pertinent data appears to be an option that would facilitate the TMDL development required to the CWA. Integration of monitoring programs and TMDL programs is prudent to develop a monitoring strategy that would accomplish the needs of both program areas.

4. Adequate modeling and contracting

Resources needed for developing TMDLs for various pollutants are different. For example, fecal coliform bacteria TMDLs for recreational use versus nutrient TMDLs for aquatic life use have very different resource needs. Nutrient TMDLs are very complex and requires large amounts of data, complex modeling applications, and technical expertise. At times these resources are limited internally. One option is to contract development of such TMDLs. In evaluating this option, factors such as funds and resources required to develop such complex TMDLs internally versus contracting should be thoroughly evaluated. Planning, understanding the expectations, detailing the entire task, resource needs, etc. is very important while developing a scope of work for contracting of the TMDL development. At times contracting of TMDL that have not been developed might be beneficial not only to fulfill the TMDL program requirements but the process can then be used to enhance and train the staff in model application competency for future internal TMDL development.

5. Public and Stakeholder Involvement

For a TMDL development program to be effective in meeting its goals and requirements, a meaningful and continued public involvement from the commencement through its implementation is crucial. Stakeholders generally include local, state, and federal government staff; pollutant sources; environmental advocacy groups; watershed organizations; universities; and individual residents. Making public involvement an integral part of the TMDL program assures a better chance of achieving the goal of improving water quality. In order to accomplish this objective, the program has taken several steps in the right direction. Some improvements include the following: developing a web page that houses all of the TMDL program information; developing a TMDL list server that has more than 700 emails of all interested stakeholders statewide; engaging stakeholders via public information meetings and forums; and updating the web information for the status of the TMDL development. These are some of the steps taken to have a continued and meaningful public involvement in the TMDL program.

6. Legal Appeals and Challenges

One of the outcomes of a TMDL development is for point source discharges (permitted discharges) to potentially deploy structural and non-structural best management practices (BMPs) for required pollutant reductions called for in the TMDLs. Hence, TMDL development is vulnerable to challenges and appeals from those entities required to meet the requirements and assumptions of the TMDL. Also, EPA and states have been sued in courts for not establishing an adequate

number of TMDLs to meet the regulatory requirements as mandated by the CWA. The TMDL program is faced with balancing all of the above stated factors to develop TMDLs that are defensible and implementable. One of the goals of the TMDL program is to work collaboratively with all entities affected by such TMDLs to get them on board with the concept, need, mandate, and requirement of the program. It is recommended that TMDLs developed with collaboration from such entities will have a greater chance to be implemented and less of a chance to be appealed and litigated.

Findings and Recommendations:

The TMDL program coordinates efforts across various program areas and across Federal, State, and local jurisdictions to achieve water quality standards in impaired water bodies. For TMDLs with significant non-point sources and stormwater related contributions this can be very challenging. This is because it involves working with a variety of partners at different levels of government and engaging non-point sources to take voluntary actions to improve water quality. Hence, the following recommendations are outlined to improve how DHEC focuses their limited resources to develop defensible TMDLs and encourage implementation of TMDLs.

- 1. Need for greater and sustainable funding to support staffing adequate and experienced TMDL developers, water quality and flow data collection, model development, and implementation activities.** One option would be for EPA to help influence and leverage other federal funds, especially from USDA and Farm Bill

agricultural money, to support TMDL development and implementation, as Section 319 monies are limited. The second option is for the development of public-private partnerships in watersheds where large and complex TMDLs development efforts are being initiated. This may include gathering water quality data by leveraging resources from all entities affected by the TMDL and even provide contractual support for modeling efforts. The third option is to continue to develop technically sound budget proposals that can be utilized to obtain additional state funds and/or applied for competitive grant.

2. **Need for appropriate water quality data is a key factor for successful TMDL development and implementation efforts.** Especially, developing strategies to increase the availability of data on runoff quantity and quality and non-point source loadings. This would entail targeted non-point source and stormwater related monitoring activities. This improved data set will facilitate the TMDL development with individual load allocations for specific sources (instead of lump sum allocation) and in turn allow the opportunity to influence the commitment and actions of such sources to improve water quality. One recommendation is to collaborate with all potential entities within a TMDL watershed area to leverage resources and develop a monitoring plan that would be shared funded. A public-private partnership might be an option to get the data needed for a TMDL development.
3. **Need to have adequate model application that can be repeatable.** Invest in building long term process model applications that can be readily optimized to site-

specific conditions to develop TMDL for various pollutants. It includes, but not limited, acquiring adequate hardware and software's, building model applications based on data availability, and contractual training for staff knowledge and model development.

4. **Need for appropriate guidance and policy to address the TMDL development for narrative standards, biological standards, and modeling runoff from specific land uses.** Development of such regional guidance and case study guidance would facilitate technology and knowledge transfer between various States and other research organizations. Revisit and possibly revise existing standards that might have been developed decades ago to reflect the current conditions and has a reasonable assurance to be achieved via TMDL development and implementation process.
5. **Need for a meaningful and continued public involvement process.** Developing targeted communication strategies for various stakeholders to facilitate specific TMDL development efforts is recommended. The goal would be to raise awareness of TMDLs among water quality decision makers as well as encouraging their direct involvement in developing and implementing activities to improve water quality. Building trust and relationships, sharing ideas, and being proactive in engaging everyone throughout the process is critical. This is easier said than done at times. Meeting in-person and discussing all of the controversial issues is strongly recommended. This will allow for filtering issues that are common and can be easily

resolved, building trust and relationship that would in turn facilitate resolution of more contentious issues. The recommendation is to continue to engage all entities with an open mind and utilizing all resources available.

6. **Encourage development of detailed TMDLs documents that can then be used for implementation planning.** This would entail specifically identifying necessary reductions targeted towards various sources and follow-up monitoring for implementation effectiveness. More importantly clarification to existing regulations to reduce the ambiguity especially, with respect to management of stormwater runoff and non-point source controls via TMDL process would be very helpful. The goal is to develop TMDL document that would help provide source specific reduction goals. Then this information can be used to develop plans that would direct specific resources for deployment of structural and non-structural best management practices within a watershed to improve water quality. Empirical monitoring and modeling predictions can then be used to collect and evaluate the effectiveness of implementation plans in improving water quality.

Conclusion:

If there was an opportunity to modify and implement any of the above recommendations I would first attempt to clarify ambiguity in existing regulations and possibly proposed comprehensive regulations that would not only govern development but implementation of the TMDLs. Second, I would revise the existing water quality standards to make it more practical and achievable. Thirdly, I would build public-private partnership to

leverage gathering of all available resources (data and modeling needs). If these three recommendations were to come to fruition the development, defensibility and implementability of the TMDLs will be enhanced and will have a better chance to restore impaired water bodies. Specifically, I would strive for developing more detail and specific TMDLs, as resources permitted, as discussed to increase the chances of them being implemented in the field to achieve reduction in pollution loadings entering surface water bodies. I would continue to encourage staff to conduct robust watershed and source assessment, use appropriate tools and models, and develop TMDLs that would provide detail implementation information. I would strive to develop public-private partnerships that would provide needed data and modeling tools necessary to develop implementable and defensible TMDLs. These recommendations would allow for us to optimize the limited resources, meet the TMDL development pace, and allow for TMDL implementation projects to be successful in achieving water quality improvements.

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